DOCUMENT RESUME

ED 419 496 IR 018 907

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TITLE	Learner in Charge: Student Inquiry and Technological Literacy.
PUB DATE	1998-00-00
NOTE	8p.; In: NECC '98: Proceedings of the National Educating Computing Conference (19th, San Diego, CA, June 22-24, 1998); see IR 018 902.
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Case Studies; Comparative Analysis; Computer Assisted Instruction; *Computer Literacy; Discovery Learning; Educational Practices; Grade 5; *Inquiry; Intermediate Grades; Internet; Learner Controlled Instruction; Skill Development; *Summer Programs
IDENTIFIERS	Computer Use

ABSTRACT

This study examined technological literacy patterns and the process of inquiry in a student-centered summer program designed around inquiry and Internet utilization. Five case studies consisted of various configurations of fifth grade students from a variety of educational backgrounds. A qualitative approach to research was implemented using grounded theory and the constant comparative method of data analysis. Data in the form of observational field notes, transcripts of video, and audio tapes resulting from each summer session revealed interesting findings regarding emergent technological literacy, "computer talk," work patterns, and the inquiry process. Pronounced differences between male and female participants showed variation and specific preferences to project design, inquiry, Internet utilization, and group configurations. Results of the study are offered to classroom teachers as implications for instructional practices in computer-enhanced classrooms. (Author)

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ED 419 496

Paper Session

Learner in Charge: Student Inquiry and Technological Literacy

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Key Words: technology, Internet, World Wide Web, student inquiry

This study examined technological literacy patterns and the process of inquiry in a student-centered summer program designed around inquiry and Internet utilization. Five case studies consisted of various configurations of fifth-grade students from a variety of educational backgrounds. A qualitative approach to research was implemented using grounded theory and the constant comparative method of data analysis. Data in the form of observational field notes, transcripts of video, and audio tapes resulting from each summer session revealed interesting findings regarding emergent technological literacy, "computer talk," work patterns, and the inquiry process. Pronounced differences between male and female participants showed variation and specific preferences to project design, inquiry, Internet utilization, and group configurations. Results of the study are offered to classroom teachers as implications for instructional practices in computer-enhanced classrooms.

Current Practices in Classroom Technology

The tools human beings have for obtaining information and solving problems have drastically changed across this century. Technological innovations in the areas of occupations, transportation, and communication have had an enormous effect on education. The urbanization and industrialization that so attend the American way of life that began in the early part of the century continues today. In the forward to his futuristic book, Gates (1995) suggests that we are beginning another great journey. We aren't sure where this journey will lead, but it is certain to touch many more lives. The major change coming will be in the ways people carry out their jobs and communicate with each other. However, even though computers and various pieces of hardware are present in most, if not all, schools, the cultural change accompanying earlier educational innovations has not yet taken place for technology in most classrooms today.

While visiting local schools and classrooms, it was observed that the small amount of equipment currently in classrooms is too often turned off, disconnected, or layered with dust. The teachers who are utilizing their machines usually structure

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computer time with programmed software, such as games, or drill-and-practice packages. Computers, though visible, are not sufficiently in use and they are certainly not doing the job they could do. Technology for the most part remains on the periphery in most classrooms. Recent research has revealed that computers are still commonly, and sometimes only, used for word processing (Downes & Fatouros, 1995; Grunberg & Summers, 1992). A large number of teachers remain apprehensive regarding computers and computer-enhanced instruction while their students continue to embrace new technologies in out-of-class settings, making schooling appear even more useless and irrelevant to the lives of young learners. Still, computers are being purchased in large numbers by school systems. The availability of classroom computers has increased from approximately one computer per 125 students a decade ago to approximately one computer per 15 students today (Dyrli & Kinnaman, 1994). Networked computers are becoming as common as maps, globes, dictionaries, and encyclopedias in many classrooms. Computers with Internet access are available for students to provide information and to assist them throughout the learning process.

In terms of student research and problem solving, the Internet-connected computer has the capability to take students far beyond the classroom. The amount of information each student can access is essentially infinite. Selecting, managing, and organizing this expansive amount of information is becoming crucial to the student learning process. With the level of comfort students display regarding technology, the enthusiasm they exhibit at the prospect of computer time, and the availability of computers with Internet access, several questions surface regarding the process of examining what teachers need to know and how students can learn from being exposed to a school situation where computers, the Internet, library resources, and a lab-type setting were available to assist with individualized student-generated inquiry.

Examining Technology-Driven, Student-Generated Inquiry Practices

A need for the study was evident as a result of the sheer number of computers with Internet access that were being placed in classrooms in urban, suburban, and rural settings across the state. Prompted by two statewide initiatives in Tennessee, computers with Internet access became part of every elementary, middle, and high school classroom. The first of these initiatives—the 21st Century Classroom Program—started more than four years ago. This competitive program matched state and local school district funds to provide selected teachers with $20,000 worth of hardware and software for their classrooms. The second initiative—The ConnecTEN Project—matched curriculum with telecommunications and technology. It focused on integrating the curriculum with technology instead of employing computers solely for rewards and enrichment. As a result of the ConnecTEN Project, every school in the state gained access to the Internet. As ideal as it may seem, teachers still struggled to create environments for students that would allow them to use computers effectively, let alone work with the Internet for enhancing learning.

The purpose of the study was to examine, document, analyze, and provide a rich, thick, and dense description of how students access information and what organizational processes they employed while utilizing the Internet as they engaged

in their own individual inquiry pursuits. Using a qualitative approach outlined by Bogdan and Biklen (1994), the researcher became a participant observer in conducting five case studies consisting of upcoming fifth-grade students selected from a purposive sample in a lab-type setting. The students were engaged in individual, self-generated inquiry with the assistance of networked computers, peers, teachers, and all other resources available in the school and community. Data sets were collected through observational field notes, transcripts of video and audio tapes of each session, student journals, and photos. The project was constructed as a Summer Technology Institute and was offered at a local elementary school where parents frequently seek summer educational opportunities for their children. Observations and data collection spanned a four week period. Library access and a collection of electronic research materials such as electronic encyclopedias, electronic atlas programs, and various other CD-ROM programs designed for student research provided students with additional research material as needed. The following questions framed the study and provided the researcher with the following set of overarching themes:

> How do students use the computer and the Internet to assist in their own research/inquiry pursuits?
>
> What patterns of technological literacy emerge as students engage in inquiry?
>
> What do teachers need to know and do to support these processes?

Findings, Conclusions, and Implications for Classroom Instruction

In reflecting on methods of research and the process an inquirer follows, Boyd (1961) writes that Charles Kettering once suggested that research is nothing but a state of mind, a friendly, welcoming attitude toward change, and an effort to do things better. One of the initial questions that framed the study converged on what teachers needed to know in order to support student-generated inquiry and promote technological literacy. This question implied a focus on change. The change, aimed at common instructional practices, would provide students with the opportunity to engage in self-generated inquiry. In an attempt to offer classroom teachers insights into the process of student-generated inquiry, general findings are presented in the chronological order in which they occurred. As data collection took place, the researcher recorded daily reflections as a means of gaining understanding as well as compiling a list of implications for classroom teachers. In addition to daily entries in an observational field journal, videotapes and audiotapes of each session provided additional information to aid in understanding the nature of student interactions with peers and computers.

The first major finding that emerged as early as the first pre-institute interview session was that students were apprehensive and shy regarding sharing opinions and interests. The entire group sought teacher approval and were reluctant to grasp the freedom bestowed upon them as participants in the project. For example, during the first pre-institute session, when asked "What do you think would be important enough to find out more about?," a student participant answered, "I'm just a kid, I

don't know what's important."

During the first pre-institute session it became even more obvious that students were not accustomed to having the freedom of choice being offered. Many had difficulty putting interests down on paper and asked approval-type questions. This gradually changed as the project progressed. Given encouragement by both the researcher and teacher participant, a slow change took place. Even with the amount of freedom and encouragement students received, by the end of the study several were still apprehensive and cautious at best regarding self-dependence and confidence. Most, however, were comfortable with the freedom and ventured out beyond the teacher-approval mode.

There seemed to be a lack of trust that caused this apprehension, as well as a lack of experience with the type of setting presented. To the end of the study, students remained in a state of disbelief regarding the amount of choice they were granted. This concept emerged as an interesting finding given the fact that this particular group of students received public school instruction in many different states and schools before enrolling at the site school, which prompted the researcher to conclude that student freedom of choice regarding instruction is not a common practice in elementary schools.

Another major finding was that after the second pre-institute session, where students became familiar with the Internet, Netscape, and simple navigation, one could not differentiate between students who had prior placement in a technology-enhanced classroom and those who had no prior placement. In fact, those who were never in a technology classroom were more apt to attack simple computer problems, conduct searches, and offer assistance to others. One student who had been in a technology-enhanced classroom in both second and third grade was visibly confused and frustrated when typical computer problems presented themselves in the course of a session. There was some difference, however, between students who spent a large amount of time on home computers and those who did not. With the exception of the one student with no computer in the home, students who spent a larger amount of time using their home computers emerged as the "experts" in assisting students, offering suggestions, and conducting in-depth searches. The emergent technological literacy they brought from home had more of an impact on student processes and progress than the level of emergent technological literacy they brought from experience within a classroom setting where a computer was present.

This phenomenon could have been partially attributed to the fact that in the nonthreatening home environment, problem solving is natural, whereas in the classroom setting, computer use is most often programmed. The conclusions and implications regarding this finding are twofold. First, students have a large amount of choice when using a computer in their own home. This choice is typically not an option in the regular classroom setting. While there is value in sound educational software games, most of these games do not lend themselves to spontaneous problem solving or a great deal of student choice. Second, even with multiple computers in a classroom setting, students are still limited to what they are allowed to do on computers. Examining data collected from parent and student interviews, it was concluded that most of the activities students engaged in within the 21st Century Classroom environment or with computers in the school setting in general consisted of games or drill-and-practice. Activities were most often teacher-driven

and not student-generated.

One can therefore conclude that although the experience of being in a technology-enhanced classroom is exciting and valuable, the type of computer utilization students encounter in these classrooms does not offer the spontaneity needed for problem solving and inquiry. The study created a simulated version of the home environment in terms of the degree of opportunity for student choice within a classroom setting, implying that students can operate and function at a maximum level within a student-driven environment. Implications for future software purchases are tremendous here. Students reported that they liked the games they previously used but preferred the Internet activities. It is important that this be considered when making purchases.

Perhaps the most glaring finding was the distinct differences in computer-related behaviors between female and male participants. Beginning with the first summer session, videotapes and field notes showed that female students sought help from the researcher and teacher participant at a ratio of 14:1. Videotapes of the first session showed that females raised their hands for help 14 times for every time a male participant asked for help. Females did not leave their computers but stayed in their seats, while male students got up and walked to the researcher or teacher participant. This of course enabled the male help seeker obtain help more quickly. Male participants often sought help from other students, whereas female participants would wait for the researcher or teacher participant for help. When asked about this, one female participant told the researcher that if you asked another student, the student may not have the answer, but if you asked the teacher, you were sure to get the answer, and the right answer at that. As the study progressed, female participants asked for help less and less and were able to solve problems on a regular basis. Appearing at first to be apprehensive and reluctant about problem solving, female participants logically sought help from what appeared to be the most knowledgeable person in the room. Encouraging female students to trust themselves has important implications for classroom teachers.

Male participants were more likely to take risks and venture out to visit all hits from search results. Females, however, most often only visited the first 10 sites offered by the results. Female participants also visited fewer sites. When asked about this, female participants all said that they read the descriptions, visited the sites, found what they wanted, and stopped, instead of continuing. Female participants also told the teacher participant that once they found what they wanted, they preferred to use the information instead of seeking more. Therefore, even though at first glance it appeared that female participants were not covering as much ground as males, they were methodically searching for specific information, locating the information, and applying it to their projects.

Moving Forward With Technology

The project offered students opportunities to engage in self-generated inquiry and to utilize the Internet within a nonthreatening, student-centered environment that promoted technological literacy. To further clarify, the nonthreatening environment within the study can be described as a student-centered environment where learners

had complete control in terms of selecting topics for research, designing a project, choosing materials for the project, utilizing the Internet without formal direction, and presenting their completed projects using student-selected methods. Findings from the study showed that students need a specific environment in order to thrive and develop the skills needed to operate in a technology-driven world. Time for thinking, conversing, and movement are essential in this environment. The ability to choose and select topics of interest, develop work patterns, and operate within a self-selected group configuration allowed students to move through the inquiry process naturally.

The amount of time students spend at a computer or in a technology classroom (a 21st Century Classroom as defined by Tennessee Department of Education, 1994) has no bearing on the development of technological literacy. Instead, it is the type of tasks engaged in that develop literacy. In a 21st Century Classroom, software selection is most often haphazard and consists mainly of drill-and-practice programs. The home environment, however, is different because at home the learner is usually in charge of the learning situation. Therefore, the home computer environment seems to have the most impact on the amount of emergent technological literacy a student brings to a classroom. Sharing, assisting, and offering expertise are essential components that must be present in a technology-enhanced classroom.

To better prepare today's students for the technology-driven world they will be part of in the future, educators must examine current instructional practices, past instructional practices, software purchases, and technology implementation. The study showed that it made no difference how many years a student was placed in a 21st Century Classroom. That experience had no impact on the inquiry process, nor did it have an impact on any technological literacy patterns, work habits, or utilization of the Internet. However, the instructional practices, the nonthreatening environment, the encouragement provided by the teacher participant, and the allowances made for each student's particular preferences seemed to have the most influence on the process. With the abundance of funds allocated for classroom technology, software, and computers, it seems that these things are essential in developing the type of classroom environment needed by students who will be leading us into the next century.

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